Observation of the Leonid Meteors of 1901, *made at the Royal Observatory, Greenwich.*

(*Communicated by the Astronomer Royal.*)

On the nights of November 14–15 and November 15–16 watch for meteors was maintained by four observers from midnight to 5 A.M., with the following results :—

Date. 1901.	Length of Watch.	Total Number of Meteors.	Number of Leonids.	Number of Leonids per Hour.
November 14–15	5 hours	66	46	9·2
,, 15–16	5 ,,	43	43	8·6

The night of November 13–14 was overcast and rainy, November 14–15 was cloudless and bright, and November 15–16 was partially foggy and cloudy. The number of Leonids observed each year since 1887 is given in the *Monthly Notices*, vol. lx., p. 163. Reference to this table shows that a much larger number of meteors was observed this year, though it should be remembered that the weather was rather more favourable this year than in most of the preceding years. These observations afford some evidence that this year the Earth passed through part of the meteor swarm denser than the average, and probably denser than in any of the years 1896 to 1900.

Royal Observatory, Greenwich:
1901 *December* 19.

The Leonids, 1901. *Observations made at the Radcliffe Observatory, Oxford.*

(*Communicated by the Radcliffe Observer.*)

During the night of November 13 the sky was occasionally watched for a possible shower of *Leonids*, but few meteors were seen.

On November 15 from 12^h to 15^h G.M.T. the sky was generally clear, but high driving fog passed across at times. Mr. McClellan, who watched at frequent intervals, saw only two meteors, viz. :—

G.M.T. h m	
14 40	1st magnitude; Leonid with train from μ Leonis towards 38 Lyncis.
14 42	Sporadic.

A special watch for meteors was commenced on the night of November 14, just before 13^h G.M.T., by Mr. Robinson. Except during a short break ($15^h\ 11^m$ to $15^h\ 23^m$ G.M.T.) the watch was continuous until 18^h G.M.T. The observer remarks :—

At first the constellation of *Leo* was only dimly visible in a low mist, which, however, became less dense later on. The sky was cloudless throughout, and stars to the 5th or 6th magnitude could be easily seen, except for small altitudes. About 17^h G.M.T., and a little earlier, a long band of diffused light about 10° in width was observed stretching from the eastern horizon towards and slightly beyond the six stars forming the "Sickle." The phenomenon—probably that of the zodiacal light—became more conspicuous later on, or just before dawn. Its position then lay along the ecliptic, enveloping *Spica* in E.S.E., across the constellations of *Virgo* and *Leo*, the brightest and broadest portion being over the horizon.

The *Leonids* presented the characteristic features observed in former years, being swift, and generally leaving luminous trails, visible for two or three seconds. The approximate G.M.T. for each meteor was recorded, and notes of magnitude, direction, velocity, and trails of the more important were taken. When the observer had fully identified the brighter stars in the neighbourhood of *Leo*, several of the more luminous tracks were charted. For this purpose a wand, held and adjusted across the trail or streak, enabled a reliable observation to be made of the direction of the flight of the meteor. Seven observed in this way give a radiant of small area near

R.A. $9^h\ 55^m\ 50^s$ or 148° 58′ ; Decl. +22° 47′. Epoch 1900.

Almost invariably the paths of the other *Leonids* when produced backwards along the wand crossed the same point within the "Sickle." A number of the brighter meteors started at a great distance (about 30°) from the radiant.

Other radiants were apparently active, but meteors from these were regarded as of secondary importance, and their paths were secured with only rough approximation.

A marked peculiarity was the intermittent frequency of the *Leonids*, several long quiescent intervals being followed by active miniature showers. This feature was also noticed here in 1898 or 1899.

The following notes of meteors were taken :—

No.	G.M.T. h m	
1	12 51	1st mag.; passed between β and γ Ursæ Maj.; trail; Leonid.
2	12 58	Above Sirius; no trail; rapid.
3–6	13 0 to 13 17	In this interval 4 meteors counted, two of which possibly Leonids. The last a short bright streak above Leo.
7	13 20	Leo towards zenith; swift; no streak.

No.	G.M.T. h m	
8	13 24	S.E. Sickle; streak.
9	13 25	Leo towards zenith; very swift.
10	13 26	Short; in Gemini.
11	13 30	Short; possibly Leonid.
12	13 30	Near Pollux, below Pleiades; long bright trail.
13	13 33	1st mag.; track recorded on chart (A).
14	13 38	N. and N.W.; swift; 4th mag.
15	13 50	Short; low down N.E.; small.
16	13 51	From zenith; sporadic.
17	13 55	Ursæ Maj. to zenith; 3rd mag.
18	14 0	Above Leo; sporadic; 4th mag.
19	14 4	Through Gemini; streak; 3rd mag.
20	14 4	Below Sirius; swift; streak; 1st mag.
21	14 10	Sickle through zenith; long streak; 1st mag.
22	14 17	Near Sirius; sporadic; short; 4th mag.
23	14 19	Between ζ and μ Leonis; short; 4th mag.
24	14 21	Below Sickle; sporadic.
25	14 21	Above Sickle; sporadic.
26	14 24	Streak; 3rd mag.; path recorded (B) on chart.
27	14 30	N.E.
28	14 36	Through pointers of Ursæ Maj. to below pole; streak; bright; swift.
29	14 38	Through or near Aldebaran.
30	14 39	Passed between β and γ Ursæ Maj.; Leonid.
31	14 46	Ursæ Maj., low; doubtful Leonid.
32	14 49	Slow sporadic from between δ and β Leonis to below Regulus; streak; 4th mag.
33	14 50	Zenith towards Coma Berenices; 3rd mag.
34	14 54	Castor and Pollux to Sickle; sporadic.
35	14 55	Præsepe to γ Leonis; sporadic.
36	14 58	Sickle to between θ and α Hydræ.
37	14 59	Bright, from zenith.
38	15 2	Near δ Leonis, from Sickle.
39	15 6	Just above λ Ursæ Maj. to δ Ursæ Min. Direction same as A in chart.
	15 11 to 15 24	Break in watch.
40	15 26	Around Leo; not Leonids.
41	15 26½	
42	15 27	

No.	G.M.T. h	m	
43	15	31	Canes Venat., through Coma Berenices ; sporadic.
44	15	36	Leonid ; through α Canum Venat., below η Ursæ Maj. ; streak.
45	15	38	Leonid; slightly above θ Hydræ, to Argo ; streak.
46	15	41	From midway between Regulus and θ Hydræ, to east of Argo ; streak.
47	15	43	Passed between β and γ Ursæ Maj. ; Leonid.
48	15	43	Towards Cassiopeia ; swift ; 1st mag.
49	15	45	λ and μ Ursæ Maj. ; Leonid ; streak.
50	15	45	Below Leo ; Leonid ; streak.
51	15	47	Coma Berenices and β Leonis ; streak.
52	15	(49)	Sporadic ; west of Leo.
53	15	50	Leonid ; between Regulus and o Leonis.
54	15	54	Towards S.E., from the western sky.
55	15	57	Leo to east of α Hydræ ; very swift ; no trail.
56	16	0	Bright ; streak ; path recorded on chart (C).
57	16	0½	Probably Leonid.
58	16	4	N.E. ; swift.
59	16	7	Through Procyon ; bright streak ; Leonid.
60	16	7	Leonid ; faint.
61	16	9	Sporadic.
62	16	10	Through ι and κ Ursæ Maj. ; bright.
63	16	10	ENE^{ly} direction ; bright.
64	16	21	NW^{ly} direction ; streak.
65	16	21	Streak.
66	16	21	Streak.
67	16	22	Streak ; towards η Ursæ Majoris from Radiant.
68	16	22	Streak ; towards Ursa Major from Radiant.
69	16	23	Towards Arcturus.
70	16	26	Radiant to α Ursæ Maj. ; streak.
71	16	27½	1st mag. ; sporadic ; Ursa Maj. ; N.E. of Arcturus ; sinuous.
72	16	29	Leonid ; streak, towards Castor.
73	16	31	Sporadic.
74	16	37	Streak ; sporadic ; Præsepe through ϵ Leonis.
75, 76	16	42	Two short Leonids, the first near γ Leonis, the second below the Sickle.
77, 78	16	46	Two from zenith to east ; sporadic.
79, 80	16	49	Two doubtful Leonids.
81	16	56	Streak ; Radiant to east.

No.	G.M.T. h m	
82	16 56	Streak; Radiant to east.
83	16 56	Streak; charted (D).
84	17 0	Leonid; towards δ or β Leonis.
85	17 2	Low E.S.E.; possibly Leonid.
86	17 5	No streak; in Leo.
87	17 5	No streak; in Leo.
88	17 6	Short; Leo; no streak.
89	17 12	Short; in Leo.
90	17 14	East of Regulus; eastwards.
91	17 15	Below Sickle; sporadic.
92	17 19	Leonid; Virgo.
93	17 20	Sporadic; Hydra.
94	17 21	Streak.
95	17 21	Bright; rapid; low down.
96	17 22	Streak from Hydra; sporadic.
97	17 23	Leonid; near Regulus; streak.
98	17 29	Streak; Leonid; between Hydra and Præsepe.
99	17 33	Leonid; below Arcturus.
100	17 34	Bright streak; charted (E).
101	17 44	To zenith.
102	17 45	To east.
103	17 45	Streak to N.E.
104	17 53	Streak; Leonid.
105	17 53	Streak; Leonid; charted (F).
106	17 59½	Bright streak; charted (G).
	18 0	Watch relinquished; twilight increasing.

The positions of the seven charted paths were as follows:

Epoch 1880.

		R.A. h m	Dec. ° ′		R.A. h m	Dec. ° ′
(A)	From	9 59	+32 30	To	10 11	+50 0
(B)	„	9 6	+13 0	„	8 26	+6 0
(C)	„	10 55	+30 15	„	12 0	+39 30
(D)	„	9 53	+17 0	„	9 53	+5 0
(E)	„	9 10	+16 45	„	8 0	+7 30
(F)	„	9 37	+18 0	„	9 0	+5 0
(G)	„	10 24	+23 0	„	12 1	+20 0

Radcliffe Observatory, Oxford:
1901 *December* 11.

Apparent Paucity of the Leonid Stream.
By the Rev. S. J. Johnson.

The morning of November 14 was densely clouded; that of the 15th clear and frosty, giving opportunity for observation, especially as the Moon was absent. A little watching soon showed that the shower, though existing, was very feeble at the time and far inferior to that of the *Perseids* last August. It was about equal in intensity to that which I witnessed on the morning of 1896 November 14. From 2^h to $2^h\ 45^m$ (morn.) on the 15th I observed three *Leonids*, the largest being at $2^h\ 42\frac{1}{2}^m$, about 10° beneath *Regulus*; also one non-*Leonid* across η.

From 4^h to 5^h (morn.) five *Leonids*, two of which equal bright first magnitude stars, one at $4^h 7^m$, just beneath 46 *Leon. Min.*, greenish. From about 161°+34° to 163°+36°; the other at $4^h\ 24^m$, started about 3° left of *Arcturus*. From 215°+21° to 220°+18°.

On the morning of the 16th the radiant was slightly more active. Still, the Earth could only have been passing through outlying portions of the shower. From $4^h\ 55^m$ to 6^h A.M. I noticed nine *Leonids*, all within the first thirty-five minutes.

At $4^h\ 55\frac{3}{4}^m$ (morn.) nearly equal *Jupiter*, green train. Just beneath β *Leonis*. 173°+16° to 180°+13°.

At $5^h\ 1\frac{1}{4}^m$ magnitude 1 train. From a point 7° above δ *Leonis* going towards 12 *Coma Beren.* 168°+27° to 180°+28°.

At $5^h\ 23\frac{3}{4}^m$ equal *Jupiter*. Between ϵ *Virginis* and *Arcturus*. 197°+21° to 207°+11°.

All the *Leonids* seen had momentary trains.

Place of observation, window facing eastern heavens with several obstructions.

Melplash Vicarage, Bridport:
Nov. 30.

The Leonids, 1901. By F. W. Henkel, B.A.

The weather having been better on the whole than is usual at this time of the year at Markree, there was an opportunity of observing any display of meteors should it occur, but nothing of any consequence was seen here on the nights of November 15 and 16, which were clear for the most part. Being myself in England at the time, in the neighbourhood of Epping Forest, I made a watch from about 11 P.M. till towards daylight on the night of the 15th–16th, but saw nothing worthy of remark. The following night (Saturday) there was a dense fog, which prevented anything being seen of the sky at all. A gentleman whose occupation involves his being in London most part of the night, and who